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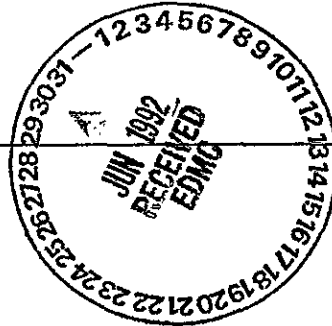
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7. Abstract

There are two main contributors to the 241-A Tank Farm liquid effluent that is discharged to the 216-B-3 Pond. The source, volumes and controls for these contributors are described to justify the sampling point and frequency for this stream. Sample collection methods, sample handling requirements, constituents for which the samples will be analyzed and the associated quantitation limits are specified in the plan.

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**241-A TANK FARM COOLING WATER
SAMPLING AND ANALYSIS PLAN**

March 11, 1992

Tank Farms Environmental Engineering

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1.0 INTRODUCTION

This Sampling and Analysis Plan has been prepared for the 241-A Tank Farm Cooling Water effluent stream as required by the May 21, 1991 proposed amendments to the Hanford Federal Facility Agreement and Consent Order, (Ecology et al. 1989), otherwise known as the Tri-Party Agreement. In addition, Washington Department Of Ecology (WDOE) Consent Order No. ED-91NM-177, For the Permitting of Liquid Effluent Discharges Under the Washington Administrative Code (WAC) 173-216, requires the submittal of SAP's for the permitting of effluent wastewater streams.

This SAP documents the methods and frequency of sampling and the requirements for laboratory analysis, in order to determine the constituents of the 241-A cooling water wastestream. It has been developed in accordance with the Liquid Effluent Sampling Quality Assurance Project Plan, WHC-SD-WM-QAPP-011, Rev. 1 (WHC 1992). The QAPP is intended to ensure that procedures are implemented and that the sampling and analysis work is performed to the proper level of control in order to meet the data quality objectives which it describes. The SAP shall take precedence over the QAPP in the implementation of specific responsibilities and methods, if discrepancies should exist.

2.0 OBJECTIVES

Sampling and analysis of 241-A cooling water wastestream is based on the following objectives.

- Provide data on chemical and radiological constituents to calculate loading and rate of migration to support the impact assessment of continued discharge.
- Provide data for Best Available Treatment - Economically Achievable evaluations and liquid effluent treatment system design, if needed.
- Provide data to support dangerous waste designation for the liquid effluents, if needed.

All changes to the approved sampling and analysis plan shall be considered a class 3 change per the Hanford Tri-Party Agreement.

3.0 SITE BACKGROUND

3.1 FACILITY DESCRIPTION

Each of the 241-AY and -AZ Tank Farms, also known as the "aging waste" tank farms, has two underground double-shell tanks (DST) equipped with above-ground monitoring and control facilities. These DSTs are used for safe

storage of high-level radioactive waste. The primary tank is 75 ft in diameter and the secondary tank is 80 ft in diameter. The dome is 45 ft 9 in. high at the dome center. Each tank has an internal steam coil. Although all four aging-waste tanks are equipped to store aging waste, only the two 241-AZ tanks currently contain aging waste. The 241-AY tanks, which contain other wastes, were completed in 1970. Tank 102-AZ was completed in 1974 and tank 101-AZ was finished in 1977. An aerial view of the tanks showing the position of the tanks relative to each other and the surrounding area is shown in Figure 2-1.

The aging waste tanks have a ventilation system and steam coils that are designed to allow heating the waste to maintain a desired liquid temperature or boiloff rate. The main purpose of the 241-A tank farm cooling water wastestream is to provide a cooling mechanism in this ventilation system to allow contaminated water vapors to be condensed and returned to the tank. Three shell and tube condensers are housed in the 241-A-401 Building located southeast of the tanks. The building is divided into the condenser cells, hot pipe gallery and the operating gallery where the raw water piping, instruments and controls are accessible.

3.2 STREAM DESCRIPTION

The 241-A tank farm cooling water stream is made up of one major contributor, the condenser cooling water, and several smaller ones. The flow from all of the contributors merges at the warm water sump. This stream flow is then directed to the 216-B-3 Pond for soil column and evaporative disposal. The configuration of the contributors is illustrated in Figure 2-2. The following sections present a detailed description of each of the contributors.

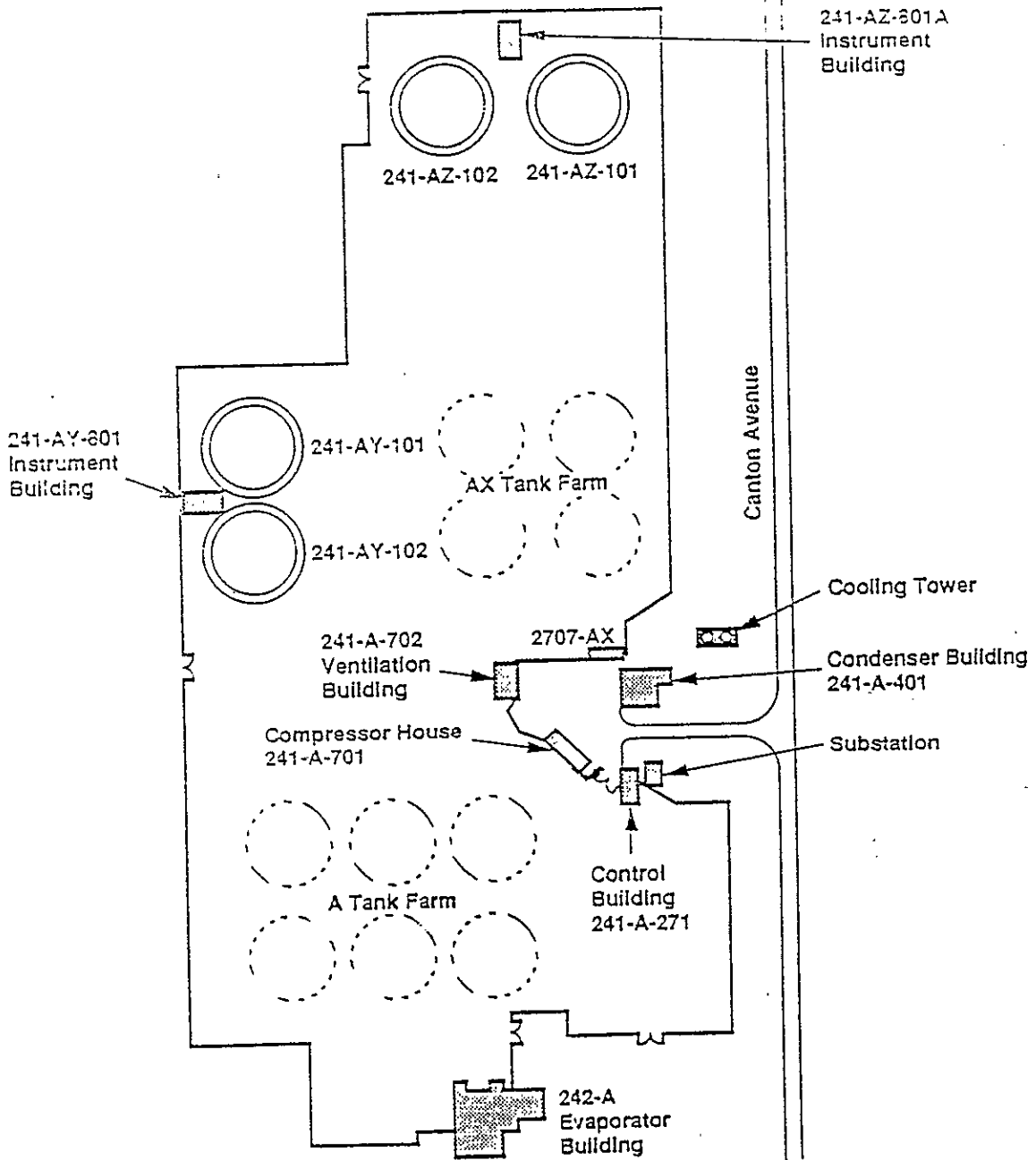
3.2.1 CONDENSER COOLING WATER

Exhaust gases from the aging-waste tank ventilation system are directed to the shell side of the condensers located in the 241-A-401 Building condenser facility. This contaminated vapor is maintained at a slight vacuum when compared with atmospheric pressure. Cooling water flows in the tube side of the condensers to allow heat transfer and the condensation of water vapors contained in the exhaust gases. The condensed water vapors are then returned to the aging-waste system.

The cooling water flowrate averages about 600 gal/min through the condensers, which represents over 98% of the total stream flow. The water is maintained at a positive pressure to ensure flow in the cooling water system. This pressure difference across the tubes (cooling water at the high pressure) precludes a leak of contaminants into the cooling water system. A leak would actually flow out of the cooling water system and into the condensed water vapors from the ventilation system.

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Figure 2-1 241-AY and 241-AZ Tank Farms

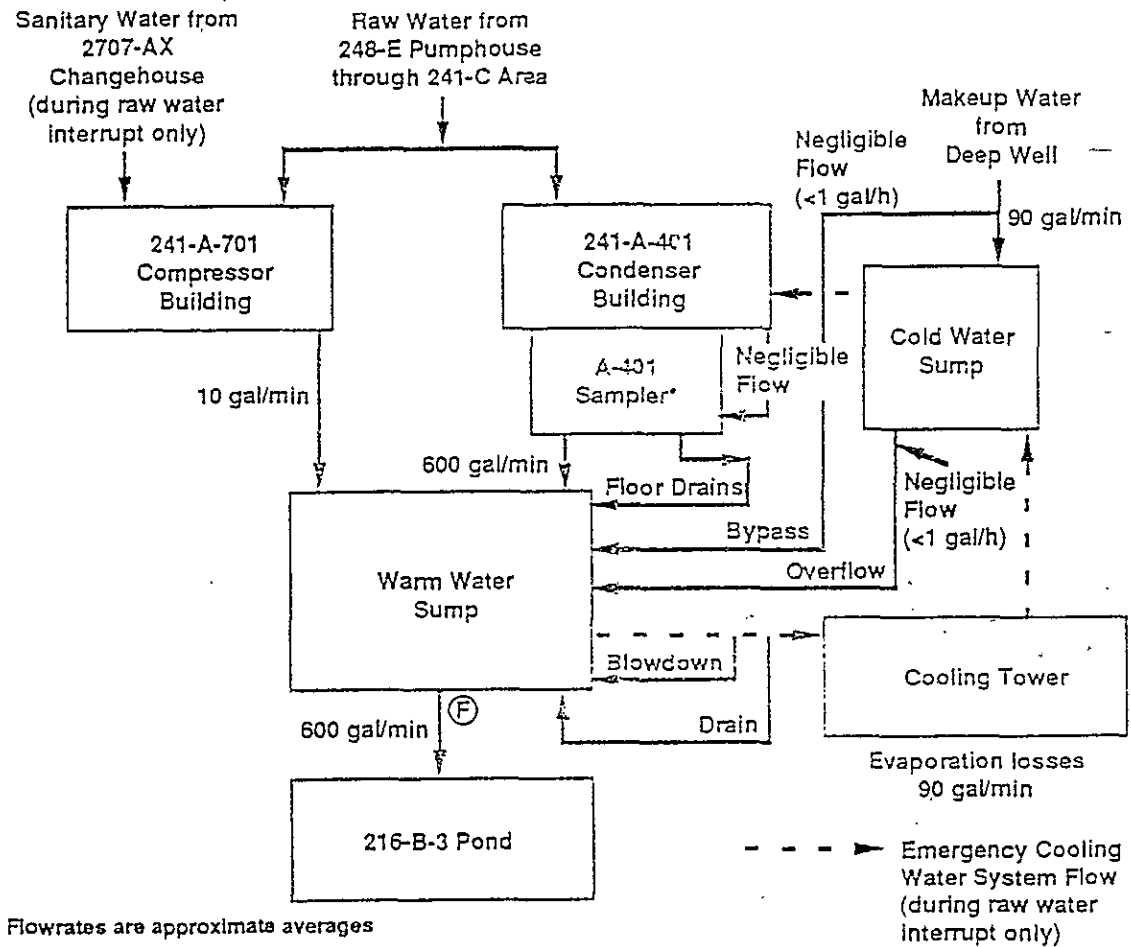


Figure 2-2 Cooling Water Stream Configuration

There is a proportional sampler connected to the condenser cooling water discharge line in the 241-A-401 Building operating gallery as it flows into the warm water sump. A beta-gamma radiation monitor also exists on this line and is used to detect the presence of radionuclides in the stream. In the case of an alarm of this monitor, the wastestream flow to B-3 Pond is manually stopped and the emergency cooling water system (ECWS) is put into use.

3.2.2 CONDENSER FACILITY FLOOR DRAIN

The 241-A-401 Building condenser facility floor drain line is fed from drains in the operating gallery. Discharges to these drains consist of water from the service sink and safety shower. This flow is sporadic in nature and attributes <1 gal/d on a normal basis. No hazardous materials or chemicals are stored or used in the 241-A-401 operating gallery.

3.2.3 AIR COMPRESSOR COOLING WATER

Many of the monitoring instruments in the 241-A tank farm, including level and pressure indicators, use compressed instrument air to function. Compressed air is also used in other equipment and processes. A supply of compressed air is essential for proper operation of the 241-A tank farm.

The air compressors require cooling water to keep the equipment at the proper operating temperature. Insufficient cooling water would allow the reciprocating parts to overheat and be damaged. The cooling water used is raw water from Columbia River that is supplied from the 200 East Area Powerhouse. If the raw water supply were interrupted sanitary water could be used for compressor cooling.

Two air compressor are located in the 241-A-701 Building. The air compressor stream consists of water that is not in proximity to any waste or hazardous materials. No chemicals are added to the cooling water. Cooling water discharge is estimated at approximately 10 gpm and is consistent even when the two compressors switch operating status. One discharge line connects the compressor building with the warm water sump.

These compressors are scheduled to be replaced by July 1992. The new compressors will have closed loop cooling, eliminating compressor cooling water discharge.

Other contributors to the compressor cooling water stream include blowdown from the air receiver and dryer. The source of the water in the blowdown is water vapor from the air that condenses as the air is compressed, changing the vapor saturation level. Flow contributions from these sources are intermittent and small (<1 gpm) when they occur. The impact is negligible both in terms of water volume and contaminant increase.

3.2.4 EMERGENCY COOLING WATER SYSTEM

The ECWS is intended to provide cooling water to the condensers located in the 241-A-401 Building during an interruption of the raw water supply. The system involves the use of a closed-loop operation that includes a cooling tower as the source of heat removal capabilities. During operation of this system, cooling water from the condensers flows in the normal configuration to the warm water sump. The route of the cooling water is changed to then flow to the cooling tower. Evaporation and heat transfer to the air then occurs in the cooling tower and lowers the cooling water temperature. The cooling water is then returned to the cold sump where 90 gal/min of makeup water from a deep well is added to offset evaporation losses. The water from the cold water sump is then returned to the condensers for reuse in the system.

The contributors to the cooling water wastestream from the ECWS include the cold water sump overflow, makeup water bypass, ECWS blowdown, and the ECWS drain. The overflow line originates at the cold water sump and drains to the warm water sump. A bypass line exists to allow make-up water to be added directly to the warm water sump. The blowdown and drain lines originate from the warm water line to the cooling tower. Both of these lines drain to the warm water sump when in use. The use of the blowdown line leads to some discharge to B-3 Pond with makeup water brought in at the cold water sump.

The ECWS is normally inactive and makes no flow addition to the 241-A tank farm cooling water wastestream. The system is functionally tested on a frequency of once per month. Short-term raw water outages at a frequency of once or twice a year have occurred in the past, forcing operation of the ECWS. The system is also used once or twice a year to allow maintenance of the raw water system.

3.3 RECEIVING SITE DESCRIPTION

The 216-B-3 Pond System consists of a series of four earthen, unlined, interconnected ponds and the 216-B-3-3 Ditch. The 216-B-3-3 Ditch is approximately 3,700 feet long, 30 ft wide at ground level, 6 ft wide at the bottom, and 6 to 12 ft deep. The cooling water wastestream is hard piped to the head end of the 216-B-3-3 Ditch, where it is discharged to the ditch, along with various other streams. Water discharged to the 216-B-3-3 Ditch flows directly into the 216-B-3 Pond System. The first pond, or lobe, is the 216-B-3 Pond. It was placed into service in 1945, and covers a surface area of approximately 35 acres, anywhere from 2 to 20 ft deep. Overflow from this first lobe runs into the second lobe, 3A. This lobe covers approximately 11 acres and is about 2.0 ft deep. Overflow from 3A runs into the 3C Pond, which has a designed surface area of 41 acres. This lobe has eight, parallel trenches, approximately 8 to 14 ft wide and 4 ft deep, cut into the bottom of it to increase percolation into the soil. At the present time, water covers about 1/3 the trench area within the lobe.

4.0 RESPONSIBILITIES

Sampling will be performed by technicians from the Sampling & Mobile Laboratories (S&ML) group. All sampling will meet the quality assurance requirements of SW-846 (EPA 1986). The sampling group technicians have training and experience necessary to perform protocol sampling. This includes training in sample security, preservation and shipping.

A laboratory will be selected by Effluent Treatment Programs (ETP) to perform analysis of samples taken under the Hanford liquid effluent program. This laboratory must meet the criteria of this Sample and Analysis Plan and the Liquid Effluent Sampling Quality Assurance Project Plan (QAPP) (WHC 1992). ETP, or its designee, shall coordinate sample shipment to the selected laboratory with the sampling group. Data from the analyses will be validated by ETP or a qualified contractor. Validation will be performed as described in the QAPP (WHC 1992).

Tank Farm Environmental Engineering (TFEE) is responsible for preparation and maintenance of this plan. Any changes required by changes to the process, sampling method or parameters to be analyzed will be initiated by TFEE.

The TFEE engineer appointed by the manager as responsible for liquid effluents will be the sampling task leader. Responsibilities include scheduling the sampling according to the frequency established in this document, ensuring that appropriate equipment and personnel will be available for the sampling and that sampling is done according to established procedures.

TFEE will receive the validated data package and ensure that the data is filed with the Environmental Data Management Center (EDMC). TFEE is responsible to evaluate the data for any significant changes from previous sampling activities or expected results.

5.0 SAMPLING LOCATION AND FREQUENCY

5.1 LOCATION

Total stream composition data is the most valuable in meeting the objectives stated in Section 1.0. The contributors to this stream are not used in waste processing operations, are not used in areas subject to hazardous materials spills and are unaltered from their common source. None of the contributors varies enough in quantity or characteristics to warrant sampling at the various sources. Individual contributor sampling would not provide additional useful data in meeting the stated objectives.

Grab samples of the combined stream can be obtained in the warm water sump. Grab samples are justified for this stream since the contributors are

consistent in source, flowrate and operation. The only variation to the stream is when the ECWS is used. This will be addressed by taking samples under both operating conditions. Based on this justification only combined stream grab samples will be taken.

5.2 FREQUENCY

Four samples of the cooling water under normal operation (raw water cooling) will be taken within one year following approval of this document to provide a baseline characterization. Two samples of the cooling water during ECWS operation will also be taken in the same time period. Baseline samples shall be at least one month apart. Unless the baseline suggests otherwise, a protocol sample of the 241-A Tank Farm wastestream will be taken once each year thereafter. The contributors to the stream are consistent in the current operational mode and no change in operating status is expected. If there is a major change in stream configuration two samples will be taken to assess any changes to the overall stream.

6.0 SAMPLING EQUIPMENT AND PROCEDURES

Sampling of the 241-A effluent from the warm water sump will be done using the dipper method as described in SW-846. In this method the sump cover will be removed and the cup lowered into the sump by a pole. When the cup has filled as much as possible, it is retrieved from the sample pit and the prescribed sample bottles are filled with the sampled liquid. This is repeated as necessary until all the sample bottles are full. A formal sampling procedure for this stream is being developed by TFEE and the S&ML. The procedure will be completed prior to the first sampling. The sampling will be performed by technicians trained in all phases of RCRA protocol, according to the requirements of SW-846, including sampling techniques, preservation, labeling and documentation. There is not preventive maintenance required for this sampling equipment.

Field measurements will be made for conductivity and pH at the time of sampling. The results of the field measurements are entered into the sampling logbook.

Field blanks, trip blanks and duplicate samples will be used as part of the QC program for this sampling activity. The QC samples will be taken as described in the QAPP, Section 10.0, and the information below.

For the first sampling activity an ICP metals, volatile organic analysis (VOA) and semi-VOA field blank will be prepared. Continuation of the ICP and semi-VOA field blanks will depend on the results of the sampling. VOA field blanks will be prepared for each sampling activity. The bottles will be preserved as specified for these analyses. Each bottle will be opened in the field and filled with pure reagent water. The blanks will then accompany the samples for transport, handling and analysis.

A VOA trip blank will be taken during each sampling activity. The bottles will be preserved as specified for these analyses. Each bottle will be filled and sealed then accompany the batch of containers to the sampling site. The blank will remain unopened in the field and return with the sample containers to the lab.

Duplicate samples of this stream constituents will be taken during one of the first two sampling events. Duplicates will not include the pesticides and herbicides. The duplicate samples will be taken by the same method and handled in the same fashion. The sampling of the 241-A effluent will be coordinated with the other Tank Farm sampling activities so that there will be duplicate sampling for each of the first two batches. Additional duplicate sampling will be determined based on the results of the first two batches.

Sample bottles shall be new commercially available certified precleaned glass or plastic bottles. The sample volumes and number of containers are prescribed by the analytical laboratory and are subject to change. Tentative sample volumes for the samples are:

- 125 ml plastic containers with teflon¹ lined cap, no preservative for anions
- 500 ml plastic container with teflon lined cap, pH<2 by nitric acid preservative for Inductive Coupled Plasma Metals.
- 250 ml plastic containers with teflon lined cap, pH<2 by nitric acid preservative for Atomic Absorption Metals.
- 500 ml plastic container with teflon lined cap, pH<2 by nitric acid preservative for mercury.
- 40 ml amber glass containers with septum cap (teflon-lined), for Volatile Organics.
- 1 liter amber glass containers with teflon lined cap for Semi-volatile organics.
- 1 liter amber glass containers with teflon lined cap for pesticides.
- 1 liter amber glass containers with teflon lined cap for herbicides.
- 250 ml amber glass container with teflon lined cap, pH<2 by sulfuric acid for TOC.

¹ Teflon is a trademark of the DuPont de Nemours & Co, Wilmington, Delaware.

- 500 ml plastic container with teflon lined cap for solids.
- 250 ml plastic container for pH and conductivity.
- 125 ml plastic container with teflon lined cap, pH<2 with sulfuric acid for ammonia.
- 1 liter plastic container with teflon lined cap, pH>12 with sodium hydroxide for cyanide.
- 1 liter plastic containers with teflon lined cap preserved with 2 ml nitric acid for alpha, beta, and radionuclides.
- 1 liter glass containers for phenols.
- 1 liter glass containers for dioxans and furans.

Containers for VOA samples shall be filled without bubble formation and without leaving a head space.

Sample labels shall be filled out and affixed to the containers at the time of sampling. These labels will be supplied by the sampling team. The labels shall include at least the following information:

- sample identification number.
- person collecting the sample.
- date and time of sample collection.
- place of sample collection.
- any pertinent field information.

A unique sample identification number shall be used for each sample. Sample numbers will be obtained from the Hanford Environmental Information System (HEIS) or an equivalent database.

The sample bottles shall be cleaned and radiologically surveyed for off-site release. The released sample containers shall then be bagged and re-bagged. The samples will be placed in a cooler containing ice. The cooler shall become part of the sample packaging and have tamper evident tape placed over its opening.

A logbook shall be maintained which contains information pertinent to the sampling. Entries are to contain the sample point, sample number, container volumes, date and time of collection, field measurements, any field observations, transportation information, and signatures of personnel responsible for observations. The Sampling and Mobil Laboratories group will control and maintain the logbooks.

Until a liquid effluent database accessible to the regulatory agencies is developed, sample data will be sent to the EDMC and the agencies will be

notified accordingly. The data will be part of the administrative record for the associated Tri-Party agreement milestone.

7.0 SAMPLE HANDLING AND ANALYSIS

All samples will be handled and transported to the laboratory in a manner to ensure that the integrity of the samples will be protected. Sample handling documentation will be verified by the Sampling and Mobile Lab. Packaging and shipping requirements are specified in Section EII 5.11 of the Environmental Investigations and Site Characterization Manual (WHC 1989).

Traceability of samples obtained during the sampling activity will be controlled as specified in the QAPP, Section 6.0. A chain-of-custody form will be filled out for the samples at the time of sampling and will accompany each sample. A sample may consist of several containers. The chain-of-custody will account for each container. When more than one person is involved in sampling, one person shall be designated and only that person signs as sampler. This person is the custodian until the samples are transferred to another location or group and shall sign when releasing the samples to the designated receiver.

The approved laboratory shall designate a sample custodian and a designated alternate responsible for receiving all samples. The sample custodian or his alternate shall sign and date all appropriate receiving documents at the time of receipt and at the same time initiate an internal chain-of-custody form using documented procedures.

Analytical procedures for protocol samples shall meet the quality assurance requirements of SW-846 and of the Liquid Effluent Sampling QAPP (WHC 1992). The Statement Of Work for completing the analysis shall require the approved laboratories to have existing standard operating procedures and to submit any changes in their procedures during the contract term to ETP, or designee, for approval. The SOW will describe the approval mechanism for any such changes. The approved laboratory procedures shall describe data reduction, verification, and reporting. Any necessary corrective action shall be as outlined in the QAPP, Section 14.0.

The constituents to be analyzed for are listed in Table 1. The analyte list is based on 40 CFR 264, Appendix IX (EPA 1991) with some additional analytes. Quality assurance objectives including the analytical method, precision, accuracy and completeness shall be as detailed in the QAPP. These criteria may be adjusted by agreement with the proposed laboratory prior to final approval of the contract or work order.

TABLE 1
SAMPLE ANALYTE LIST

METALS

Arsenic	Chromium	Nickel
Aluminum	Cobalt	Potassium
Antimony	Iron	Selenium
Barium	Copper	Silver
Beryllium	Lead	Sodium
Cadmium	Mercury	Vanadium
Calcium	Magnesium	Zinc
	Manganese	

ANIONS

Chloride	Fluoride
Cyanide	Phosphate
Nitrate	Sulfate
Nitrite	

ORGANICS

VOA (all 8240 analytes)
Semi-VOA (all 8270 analytes)
TOC
Dioxin\Furans

PESTICIDE/HERBICIDE

Chlorinated Herbicides (all 8150 analytes)
Organochlorinated Pesticides (all 8080 analytes)
Organophosphorus Pesticides (all 8140 analytes)

OTHER

Ammonia	pH
Alkalinity	TDS
Conductivity	TSS
Phenols	

RADIOCHEMICAL

Alpha	²⁴¹ Pu
Beta	¹⁰⁶ Ru
¹³⁷ Cs	⁹⁰ Sr

REFERENCES

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- EPA, 1986, Test Methods for Evaluating Solid Wastes, SW-846, 3rd edition, U.S. Environmental Protection Agency/Office of Solid Waste, Washington D. C.
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- WHC, 1989, Environmental Investigations and Site Characterization Manual, WHC-CM-7-7, Section 5.11, Westinghouse Hanford Co., Richland, Washington.
- WHC, 1992, Liquid Effluent Sampling Quality Assurance Project Plan, WHC-SD-WM-QAPP-011, Rev. 1, Westinghouse Hanford Co., Richland, Washington.

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